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Revised and reprinted September, 1922.

Department of Agriculture  
Agricultural Economics

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# HANDBOOK OF OFFICIAL GRAIN STANDARDS FOR WHEAT, SHELLED CORN AND OATS

Tabulated and Abridged Description of the  
Official Grain Standards of the United States  
as established and promulgated by  
the Secretary of Agriculture:

**FOR WHEAT**

As revised, effective July 17, 1922

**FOR SHELLED CORN**

As revised, effective October 3, 1921

**FOR OATS**

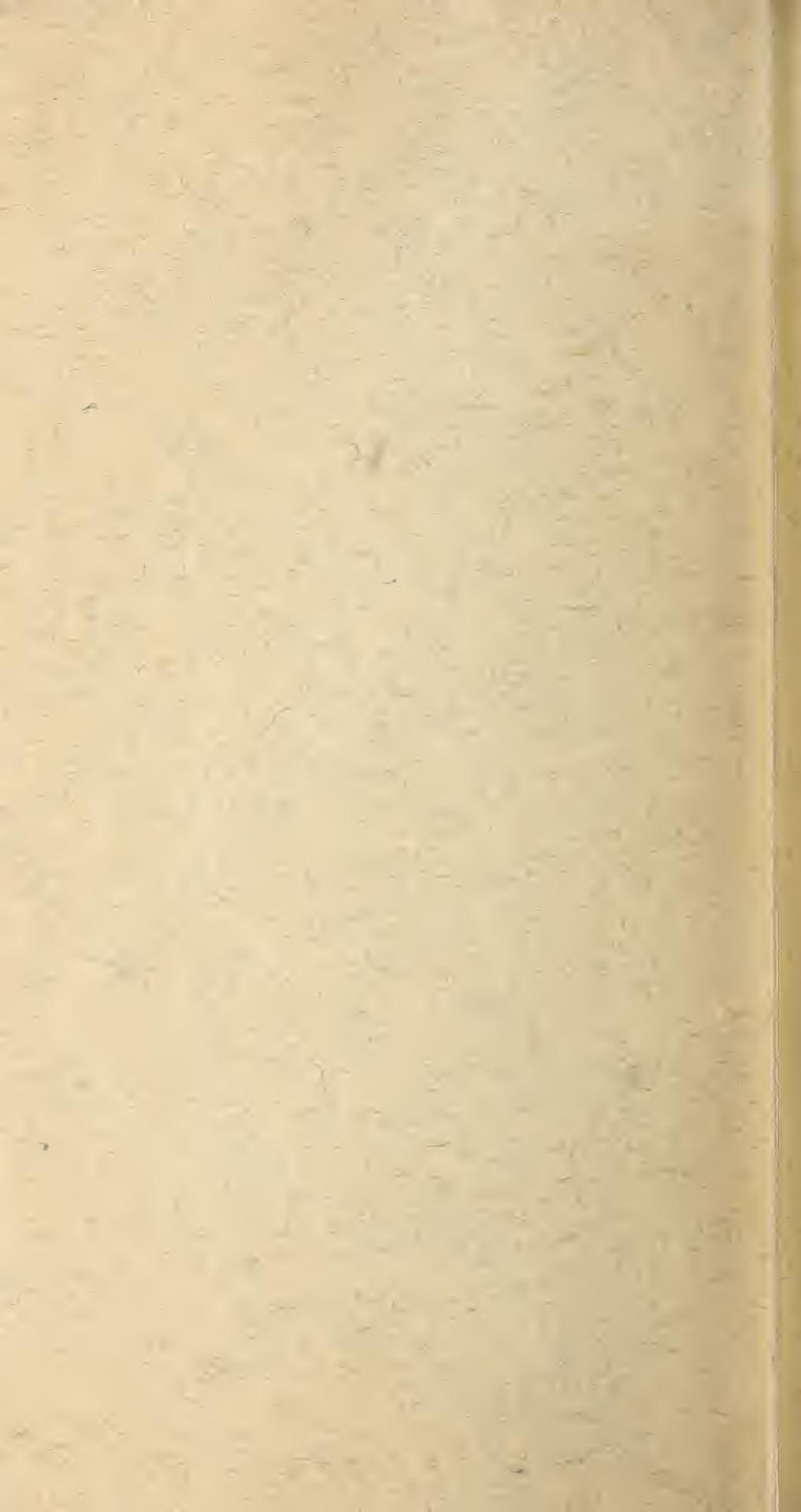
Effective June 16, 1919

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*Compiled by E. G. BOERNER, Grain Supervisor*



WASHINGTON  
GOVERNMENT PRINTING OFFICE  
1922



U. S. Department of Agriculture  
Bureau of Agricultural Economics

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## WHEAT STANDARDS

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### HARD RED SPRING WHEAT (CLASS I).

This class shall include all varieties of Hard Red Spring wheat, and may include not more than 10 per cent of other wheat or wheats. This class shall be divided into three subclasses, as follows:

#### SUBCLASS (a) DARK NORTHERN SPRING.

This subclass shall include wheat of the class Hard Red Spring, consisting of 75 per cent or more of dark, hard, and vitreous kernels. This subclass shall not include more than 10 per cent of wheat of the variety Humpback.

#### SUBCLASS (b) NORTHERN SPRING.

This subclass shall include wheat of the class Hard Red Spring consisting of less than 75 per cent and more than 25 per cent of dark, hard, and vitreous kernels. This subclass shall not include more than 10 per cent of wheat of the variety Humpback.

#### SUBCLASS (c) RED SPRING.

This subclass shall include wheat of the class Hard Red Spring consisting of not more than 25 per cent of dark, hard, and vitreous kernels. This subclass shall also include wheat of the class Hard Red Spring, consisting of more than 10 per cent of the variety Humpback.

## Class I.—Hard Red Spring Wheat.

Grade requirements for—

(a) *Dark Northern Spring*, (b) *Northern Spring*,  
(c) *Red Spring*.

Grade No.	Maximum limits of—									
	Minimum test weight per bushel			Damaged kernels.			Foreign material other than dockage.			Wheats of other classes.
	Lbs.	Pct.	Moisture.	Total.	Heat damage.	Total.	Matter other than cereal grains.	Total.	White and durum, singly or combined.	Pct.
1.....	58	14.0	2	0.1	1	0.5	5	2		
2.....	57	14.5	4	.2	2	1.0	10	5		
3.....	55	15.0	7	.5	3	2.0	10	10		
4.....	53	16.0	10	1.0	5	3.0	10	10		
5.....	50	16.0	15	3.0	7	5.0	10	10		
Sample <sup>1</sup> .....										

<sup>1</sup> Sample grade shall be wheat of the subclass Dark Northern Spring, or Northern Spring, or Red Spring, respectively, which does not come within the requirements of any of the grades from No. 1 to No. 5, inclusive, or which has any commercially objectionable foreign odor except of smut, garlic, or wild onions, or is very sour, or is heating, hot, infested with live weevils or other insects injurious to stored grain, or is otherwise of distinctly low quality, or contains small, inseparable stones, or cinders.

(1) The wheat in grades Nos. 1 to 4, inclusive, shall be cool and sweet.

(2) The wheat in No. 5 shall be cool, but may be musty or slightly sour.

(3) The wheat in grade No. 1 Dark Northern Spring and grade No. 1 Northern Spring may contain not more than 5 per cent of the Hard Red Spring wheat variety Humpback.

**DURUM WHEAT (CLASS II).**

This class shall include all varieties of Durum wheat, and may include not more than 10 per cent of other wheat or wheats. This class shall be divided into three subclasses as follows:

**SUBCLASS (a) AMBER DURUM.**

This subclass shall include wheat of the class Durum consisting of 75 per cent or more of hard and vitreous kernels of amber color. This subclass shall not include more than 10 per cent of wheat of the variety Red Durum.

**SUBCLASS (b) DURUM.**

This subclass shall include wheat of the class Durum consisting of less than 75 per cent of hard and vitreous kernels of amber color. This subclass shall not include more than 10 per cent of wheat of the variety Red Durum.

**SUBCLASS (c) RED DURUM.**

This subclass shall include wheat of the class Durum consisting of more than 10 per cent of the variety Red Durum.

## Class II.—Durum Wheat.

Grade requirements for—

(a) *Amber Durum*, (b) *Durum*, (c) *Red Durum*.

Grade No.	Minimum test weight per bushel.	Maximum limits of—									
		Moisture.			Damaged kernels.			Foreign material other than dockage.			Wheats of other classes.
		Lbs.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Total.	Soft Winter and White, singly or combined.
1.....	60	14.0	2	0.1	1	0.5	5	2	5	5	2
2.....	58	14.5	4	.2	2	1.0	10	5	10	5	5
3.....	56	15.0	7	.5	3	2.0	10	10	10	10	10
4.....	54	16.0	10	1.0	5	3.0	10	10	10	10	10
5.....	51	16.0	15	3.0	7	5.0	10	10	10	10	10
Sample <sup>1</sup> .....											

<sup>1</sup> Sample grade shall be wheat of the subclass *Amber Durum*, or *Durum*, or *Red Durum*, respectively, which does not come within the requirements of any of the grades from No. 1 to No. 5, inclusive, or which has any commercially objectionable foreign odor except of smut, garlic, or wild onion, or is very sour, or is heating, hot, infested with live weevils or other insects injurious to stored grain, or is otherwise of distinctly low quality, or contains small, inseparable stones or cinders.

(1) The wheat in grades Nos. 1 to 4, inclusive, shall be cool and sweet.

(2) The wheat in grade No. 5 shall be cool, but may be musty or slightly sour.

(3) The wheat in grade No. 1 *Amber Durum* and grade No. 1 *Durum* may contain not more than 5 per cent of wheat of the variety *Red Durum*.

**HARD RED WINTER WHEAT (CLASS III).**

This class shall include all varieties of Hard Red Winter wheat, and may include not more than 10 per cent of other wheat or wheats. This class shall be divided into three subclasses as follows:

**SUBCLASS (a) DARK HARD WINTER.**

This subclass shall include wheat of the class Hard Red Winter, consisting of 80 per cent or more of dark, hard, and vitreous kernels.

**SUBCLASS (b) HARD WINTER.**

This subclass shall include wheat of the class Hard Red Winter, consisting of less than 80 per cent and more than 25 per cent of dark, hard, and vitreous kernels.

**SUBCLASS (c) YELLOW HARD WINTER.**

This subclass shall include wheat of the class Hard Red Winter, consisting of not more than 25 per cent of dark, hard, and vitreous kernels.

## Class III.—Hard Red Winter Wheat.

Grade requirements for—

(a) *Dark Hard Winter*, (b) *Hard Winter*, (c) *Yellow Hard Winter*.

Grade No.	Maximum limits of—									
	Minimum test weight per bushel.			Damaged kernels.		Foreign material other than dockage.		Wheats of other classes.		
	Lbs.	Pct.	Pct.	Total.	Heat damage.	Total.	Matter other than cereal grains.	Total.	White and Durum, singly or combined.	
1.....	60	13.5	2	0.1		1	0.5	5	2	
2.....	58	14.0	4	.2		2	1.0	10	5	
3.....	56	14.5	7	.5		3	2.0	10	10	
4.....	54	15.5	10	1.0		5	3.0	10	10	
5.....	51	15.5	15	3.0		7	5.0	10	10	
Sample <sup>1</sup> .....										

<sup>1</sup> Sample grade shall be wheat of the subclass Dark Hard Winter, or Hard Winter, or Yellow Hard Winter, respectively, which does not come within the requirements of any of the grades from No. 1 to No. 5, inclusive, or which has any commercially objectionable foreign odor except of smut, garlic, or wild onions, or is very sour, or is heating, hot, infested with live weevils or other insects injurious to stored grain, or is otherwise of distinctly low quality, or contains small, inseparable stones or cinders.

(1) The wheat in grades Nos. 1 to 4, inclusive, shall be cool and sweet.

(2) The wheat in grade No. 5 shall be cool, but may be musty or slightly sour.

**SOFT RED WINTER WHEAT (CLASS IV).**

This class shall include all varieties of Soft Red Winter wheat, also Red Club and Red Hybrid wheats of the Pacific Northwest, and may include not more than 10 per cent of other wheat or wheats. This class shall be divided into two subclasses, as follows:

**SUBCLASS (a) RED WINTER.**

This subclass shall include wheat of the class Soft Red Winter, consisting of both light and dark colored kernels. This subclass shall not include more than 10 per cent, either singly or in any combination, of Red Russian, Red Clubs, Red Hybrids, and other Soft Red Winter wheats possessing the characteristics of those varieties as grown west of the Great Plains area of the United States.

**SUBCLASS (b) WESTERN RED.**

This subclass shall include wheat of the class Soft Red Winter, consisting of more than 10 per cent, either singly or in any combination, of Red Russian, Red Clubs, Red Hybrids, and other Soft Red Winter wheats possessing the characteristics of those varieties as grown west of the Great Plains area of the United States.

## Class IV.—Soft Red Winter Wheat.

Grade requirements for—

(a) *Red Winter*, (b) *Western Red*.

Grade No.	Minimum test weight per bushel.		Maximum limits of—							
	Red Winter.	Western Red.	Mois-ture.	Damaged kernels.		Foreign material other than dockage.		Wheats of other classes.		
	Lbs.	Lbs.		Total.	Heat damage.	Total.	Matter other than Cereal grains.	Total.	Durum.	
1.....	60	58	13.5	2	0.1	1	0.5	5	2	
2.....	58	56	14.0	4	.2	2	1.0	10	3	
3.....	56	54	14.5	7	.5	3	2.0	10	10	
4.....	54	52	15.5	10	1.0	5	3.0	10	10	
5.....	51	49	15.5	15	3.0	7	5.0	10	10	
Sample <sup>1</sup> .....										

<sup>1</sup> Sample grade shall be wheat of the subclass Red Winter or Western Red, respectively, which does not come within the requirements of any of the grades from No. 1 to No. 5, inclusive, or which has any commercially objectionable foreign odor except of smut, garlic, or wild onions, or is very sour, or is heating, hot, infested with live weevils or other insects injurious to stored grain, or is otherwise of distinctly low quality, or contains small, inseparable stones or cinders.

(1) The wheat in grades Nos. 1 to 4, inclusive, shall be cool and sweet.

(2) The wheat in grade No. 5 shall be cool, but may be musty or slightly sour.

**WHITE WHEAT (CLASS V).**

This class shall include all varieties of white wheat, whether winter or spring grown, and may include not more than 10 per cent of other wheat or wheats. This class shall be divided into three subclasses, as follows:

**SUBCLASS (a) HARD WHITE.**

This subclass shall include wheat of the class White, consisting of 75 per cent or more of hard (not soft and chalky) kernels. This subclass shall not include more than 10 per cent of wheat of the varieties Sonora and White Club, either singly or in any combination.

**SUBCLASS (b) SOFT WHITE.**

This subclass shall include wheat of the class White consisting of less than 75 per cent of hard (not soft and chalky) kernels. This subclass shall not include more than 10 per cent of wheat of the varieties Sonora and White Club, either singly or in any combination.

**SUBCLASS (c) WESTERN WHITE.**

This subclass shall include wheat of the class White consisting of more than 10 per cent of the varieties White Club and Sonora, either singly or in any combination.

## Class V.—White Wheat.

Grade requirements for—

(a) *Hard White*, (b) *Soft White*, (c) *Western White*.

Grade No.	Maximum limits of—								
	Minimum test weight per bushel.			Damaged kernels.			Foreign material other than dockage.		Wheats of other classes.
	Lbs.	Pct.	Pct.	Total.	Pct.	Heat damage.	Total.	Matter other than cereal grains.	Total.
1.....	60	13.5	2	0.1	1	0.5	5	2	
2.....	58	14.0	4	.2	2	1.0	10	3	
3.....	56	14.5	7	.5	3	2.0	10	10	
4.....	54	15.5	10	1.0	5	3.0	10	10	
5.....	51	15.5	15	3.0	7	5.0	10	10	
Sample <sup>1</sup> .....	.....	.....	.....	.....	.....	.....	.....	.....	Durum.

<sup>1</sup> Sample grade shall be wheat of the subclass Hard White, Soft White, or Western White, respectively, which does not come within the requirements of any of the grades from No. 1 to No. 5, inclusive, or which has any commercially objectionable foreign odor except of smut, garlic, or wild onions, or is very sour, or is heating, hot, infested with live weevils or other insects injurious to stored grain, or is otherwise of distinctly low quality, or contains small inseparable stones or cinders.

(1) The wheat in grades Nos. 1 to 4, inclusive, shall be cool and sweet.

(2) The wheat in grade No. 5 shall be cool, but may be musty or slightly sour.

**DEFINITIONS. GRADES FOR MIXED TREATED, GARLICKY, AND SMUTTY WHEAT.**

For the purpose of the official grain standards of the United States for wheat:

**Wheat.**—Any grain which, when free from dockage, contains more than 10 per cent of grain of a kind or kinds other than wheat shall not be classified as wheat. The term "wheat" in these standards shall not include emmer, spelt, and einkorn.

**Basis of determinations.**—Each determination of dockage, moisture, temperature, odor, onions, garlic, and live weevils or other insects injurious to stored grain shall be upon the basis of the grain including dockage. All other determinations shall be upon the basis of the grain when free from dockage.

**Percentages.**—Percentages, except in the case of moisture, shall be percentages ascertained by weight.

**Percentage of moisture.**—Percentage of moisture in wheat shall be that ascertained by the moisture tester and the method of use thereof described in Circular No. 72, and supplement thereto, issued by the United States Department of Agriculture, Bureau of Plant Industry, or ascertained by any device and method giving equivalent results.

**Test weight per bushel.**—Test weight per bushel shall be the weight per Winchester bushel as determined by the testing apparatus and the method of use thereof described in Bulletin No. 472, dated October 30, 1916, issued by the United

States Department of Agriculture, or as determined by any device and method giving equivalent results.

**NOTE.**—Under regulations pursuant to the United States grain standards Act, licensed inspectors are required to state under "Remarks" in all certificates issued by them for wheat, unless issued for an export shipment, the test weight per bushel in whole pounds and tenths of a pound.

**Dockage.**—Dockage includes sand, dirt, weed seeds, weed stems, chaff, straw, grain other than wheat, and any other foreign material, which can be removed readily from the wheat by the use of appropriate sieves, cleaning devices, or other practical means suited to separate the foreign material present; also undeveloped, shriveled, and small pieces of wheat kernels removed in properly separating the foreign material, and which can not be recovered by properly rescreening or recleaning. The quantity of dockage shall be calculated in terms of percentage based on the total weight of the grain including the dockage. The percentage of dockage so calculated, when equal to 1 per cent or more, shall be stated in terms of whole per cent; and when less than 1 per cent shall not be stated. A fraction of a per cent shall be disregarded. The percentage of dockage, so determined and stated, shall be added to the grade designation.

**Foreign material other than dockage.**—Foreign material other than dockage shall include all matter other than wheat which is not separated from the wheat in the proper determination of dockage, except as provided in the case of smutty wheat.

**Cereal grains.**—Cereal grains shall include rye, barley, emmer, spelt, einkorn, corn, grain sor-

ghums, oats, and rice only, and shall not include buckwheat, flaxseed, and wild oats.

**Heat-damaged kernels.**—Heat-damaged kernels shall be kernels and pieces of kernels of wheat which have been distinctly discolored by external heat or as a result of heating caused by fermentation.

**Live weevils.**—The regulations pursuant to the United States grain standards Act provide that “(n) in the case of grain graded ‘Sample Grade’ solely on account of the presence of live weevil or other insects injurious to stored grain, the certificate shall state in the space for ‘Remarks’ the grade to which the grain would otherwise be entitled, and there shall also appear on the certificate a statement of the factor or factors which would determine the grade were it not for the presence of such live weevil or other insects injurious to stored grain.”

#### MIXED WHEAT.

**Mixed wheat.**—Mixed wheat shall be any mixture of wheat not provided for in the classes from I to V, inclusive.

**Grades for mixed wheat.**—Mixed wheat shall be graded according to each of the grade requirements common to all of the subclasses of the class of the wheat which predominates over each other class in the mixture, except that (1) all of the grade requirements in any subclass as to the maximum percentage of other wheat or other varieties of wheat shall be disregarded, and (2) when soft red winter wheat so predominates, the grade requirements as to test weight per bushel shall be those of the subclass Red Winter. The grade designation of mixed wheat shall include, successively, in the order named, the number of

the grade or the words "Sample Grade," as the case may be, the word "Mixed," and, in the order of its predominance, the name and approximate percentage of each class of wheat which constitutes 10 per cent or more of the mixture; but if only one class exceeds 10 per cent of the mixture, the name and approximate percentage of that class shall be added to the grade designation, followed by the name and approximate percentage of at least one other class.

#### **TREATED WHEAT.**

**Treated wheat.**—Treated wheat shall be wheat of which more than 10 per cent has been scoured, limed, washed, or treated in any similar manner.

**Grades for treated wheat.**—Treated wheat shall be graded and designated according to the grade requirements of the standard applicable to such wheat if it were not treated, and there shall be added to, and made a part of, its grade designation a statement indicating the kind of treatment.

#### **GARLICKY WHEAT.**

**Garlicky wheat.**—Garlicky wheat shall be all wheat which has an unmistakable odor of garlic or wild onions, or which contains garlic or wild onion bulblets in a quantity equal to one or more bulblets in 1,000 grams of wheat.

**Grades for garlicky wheat.**—Garlicky wheat shall be graded and designated according to the grade requirements of the standard applicable to such wheat if it were not garlicky, and there shall be added to, and made a part of, its grade designation the word "Garlicky."

The regulations pursuant to the United States grain standards Act provide that "(o) unless issued

for an export shipment, in the case of wheat graded 'Garlicky' on account of the presence of garlic or wild onion bulblets, there shall be stated in the space for 'Remarks' the approximate quantity of garlic or wild onion bulblets present, using the following terms: 'Light garlicky,' 'Medium garlicky,' or 'Heavy garlicky.' 'Light garlicky' is hereby defined to mean garlic or wild onion bulblets in an amount equal to one to three bulblets, inclusive, in one thousand grams; 'Medium garlicky' is hereby defined to mean garlic or wild onion bulblets in an amount equal to four to fifteen bulblets, inclusive, in one thousand grams; and 'Heavy garlicky' is hereby defined to mean garlic or wild onion bulblets in an amount equal to more than fifteen bulblets in one thousand grams."

#### **SMUTTY WHEAT.**

**Smutty wheat.**—Smutty wheat shall be all wheat which has an unmistakable odor of smut, or which contains spores, balls, or portions of balls, of smut, in excess of a quantity equal to two balls of average size in 50 grams of wheat.

**Grades for smutty wheat.**—Smutty wheat shall be graded and designated according to the method described either in paragraph (a) or paragraph (b) of this section.

(a) Before the determination of smut dockage as provided in this paragraph, the wheat shall be graded and designated according to the grade requirements of the standard applicable to such wheat if it were not smutty, except that smut balls shall not be considered as foreign material other than dockage. The loss in weight caused by the removal of smut from the wheat shall be

ascertained by scouring, washing, or otherwise, and shall be calculated in terms of percentage based on the total weight of the grain free from dockage. The percentage so calculated shall be stated in terms of whole per cent and half per cent. A fraction of a per cent when equal to, or greater than, a half shall be treated as a half, and when less than a half shall be disregarded. The percentage of the "smut dockage," so calculated and stated, shall be added to the grade designation preceding the statement of dockage, if any.

(b) Smutty wheat shall be graded and designated according to the grade requirements of the standard applicable to such wheat if it were not smutty, except that (1) smut balls shall not be considered as foreign material other than dockage, and (2) when the amount of smut present is so great that any one or more of the grade requirements of the grades from No. 1 to No. 5, inclusive, can not be applied accurately, the wheat shall be classified as Sample Grade. For all grades there shall be added to and made a part of the grade designation, preceding the statement of dockage, if any, the word "Smutty."

## **SHELLED CORN STANDARDS.**

### **CLASSES OF SHELLED CORN.**

Shelled corn shall be divided into three classes, as follows:

#### **WHITE CORN.**

This class shall consist of corn of which at least 98 per cent by weight of the kernels are white. A slight tinge of light straw color or of pink on kernels of corn otherwise white shall not affect their classification as white corn.

#### **YELLOW CORN.**

This class shall consist of corn of which at least 95 per cent by weight of the kernels are yellow. A slight tinge of red on kernels of corn otherwise yellow shall not affect their classification as yellow corn.

#### **MIXED CORN.**

This class shall consist of corn of various colors not coming within the limits for color as provided in the definitions of white corn and yellow corn. White-capped yellow kernels shall be classified as mixed corn.

## Shelled Corn.

*Grade requirements for white, yellow, and mixed corn.*

Grade No.	Minimum test weight per bushel.	Maximum limits of—			
		Mois-ture.	Foreign mate-rial and cracked corn.	Damaged corn.	
				Total.	Heat damage.
1.....	55	Lbs.	Pct.	Pct.	Pct.
2.....	53		14.0	2	2 0.0
3.....	51		15.5	3	.1
4.....	49		17.5	4	.3
5.....	47		19.5	5	.5
6.....	44		21.5	6	1.0
Sample <sup>1</sup> .....			23.0	7	15 3.0

<sup>1</sup> Sample grade shall be white corn, or yellow corn, or mixed corn, respectively, which does not come within the requirements of any of the grades from No. 1 to No. 6, inclusive, or which has any commercially objectionable foreign odor, or is heating, hot, infested with live weevils or other insects injurious to stored grain, or is otherwise of distinctly low quality.

(1) The corn in grades Nos. 1 to 5, inclusive, shall be cool and sweet.

(2) The corn in grade No. 6 shall be cool, but may be musty or sour.

## DEFINITIONS.

For the purposes of the official grain standards of the United States for shelled corn (maize):

**Corn.**—Corn shall be shelled corn of the flint or dent varieties.

**Basis of determinations.**—Each determination of color, damage, and heat damage shall be upon the basis of the grain after the removal of foreign material and cracked corn as provided in the section defining foreign material and cracked corn. All other determinations shall be upon the basis of the grain including such foreign material and cracked corn.

**Percentages.**—Percentages, except in the case of moisture, shall be percentages ascertained by weight.

**Percentage of moisture.**—Percentage of moisture in corn shall be that ascertained by the moisture tester and the method of use thereof described in Circular No. 72 and supplement thereto, issued by the United States Department of Agriculture, Bureau of Plant Industry, or ascertained by any device and method giving equivalent results.

**Test weight per bushel.**—Test weight per bushel shall be the weight per Winchester bushel as determined by the testing apparatus and the method of use thereof described in Bulletin No. 472, dated October 30, 1916, issued by the United States Department of Agriculture, or as determined by any device and method giving equivalent results.

**Foreign material and cracked corn.**—Foreign material and cracked corn shall be kernels and pieces of kernels of corn, and all matter other than

corn which will pass through a metal sieve perforated with round holes twelve sixty-fourths of an inch in diameter, and all matter other than corn remaining on such sieve after screening.

**Heat-damaged kernels.**—Heat-damaged kernels shall be kernels and pieces of kernels of corn which have been distinctly discolored by external heat or as a result of heating caused by fermentation.

**Live weevils.**—The regulations pursuant to the United States grain standards Act provide that “(n) in the case of grain graded ‘Sample Grade’ solely on account of the presence of live weevil or other insects injurious to stored grain, the certificate shall state in the space for ‘Remarks’ the grade to which the grain would otherwise be entitled, and there shall also appear on the certificate a statement of the factor or factors which would determine the grade were it not for the presence of such live weevil or other insects injurious to stored grain.”

## OATS STANDARDS.

For the purposes of official grain standards of the United States.

**Oats.**—Oats shall be any grain which consists of cultivated oats and not more than 25 per cent of foreign material, other grains, and wild oats, either singly or in any combination.

**Color classification.**—All oats shall be designated as white, red, gray, black, or mixed, according to the color of the oats, as the case may be. For the purposes of this classification, white oats include yellow oats. Oats shall be white, red, gray, or black, respectively, when they consist of oats of such color, and not more than 10 per cent of other colors of cultivated and wild oats, either singly or in any combination. Mixed oats shall be all other oats.

**Grades.**—All oats shall be graded and designated as No. 1, No. 2, No. 3, No. 4, or Sample Grade, white, red, gray, black, or mixed, as the case may be, according to the respective requirements thereof as specified in these standards, except that in the case of mixed oats the requirements as to the maximum percentages of other colors shall be disregarded.

**Clipped oats.**—Clipped oats shall be oats which have the general appearance of having had the ends removed by an oat clipper. Clipped oats shall be graded and designated according to the grade requirements of the standards applicable to such oats if they were not clipped, and there shall be added to, and made a part of, such grade designation the word "clipped."

**Bleached oats.**—Bleached oats shall be oats which in whole or in part have been treated by the use of sulphurous acid or other bleaching chemicals. Bleached oats shall be graded and designated according to the grade requirements of the standards

applicable to such oats if they were not bleached, and there shall be added to, and made a part of, such grade designation the word "bleached."

### Oats.

*Grade requirements for white, red, gray, black, mixed, bleached, and clipped oats.*

Grade.	Condition and general appearance. <sup>1</sup>	Minimum test weight per bushel.	Not to exceed—					Other colors, cultivated and wild oats.
			Sound cultivated oats not less than—	Heat damaged (oats or other grains).	Foreign material.	Wild oats.		
2 1	Shall be cool and sweet and of good color.....	Lbs. 32	Pct. 98	Pct. 0.1	Pct. 2	Pct. 2	Pct. <sup>3</sup> 2	
2	Shall be cool and sweet, and may beslightly stained.	29	95	.3	2	3	4 5	
3	Shall be cool and sweet, and may be stained or slightly weath-ered.....	26	90	1.0	3	5	10	
4	Shall be cool, and may be musty, weath-ered or badly stained....	23	80	6.0	5	10	10	
Sample grade.	Shall be white, red, gray, black, mixed, bleached, or clipped oats, respectively, which do not come within the requirements of any of the grades from No. 1 to No. 4, inclusive, or which have any commercially objectionable foreign odor, or are heating, hot, sour, infested with live weevils or other insects injurious to stored grain, or are otherwise of distinctly low quality.							

<sup>1</sup> The percentage of moisture in grades Nos. 1, 2, and 3 shall not exceed  $14\frac{1}{2}$ , and in grade No. 4 shall not exceed 16.

<sup>2</sup> In the case of white oats, No. 1 shall be cool and sweet and of good white or creamy white color.

<sup>3</sup> Four per cent of other colors allowed in No. 1 red, gray, or black oats. This column does not apply to mixed oats.

<sup>4</sup> Ten per cent of other colors allowed in No. 2 red, gray, or black oats.

## DEFINITIONS.

**Basis of determinations.**—All determinations shall be upon the basis of the lot of grain as a whole including foreign material, other grains, and wild oats.

**Percentages.**—Percentages, except in the case of moisture, shall be percentages ascertained by weight.

**Percentage of moisture.**—Percentage of moisture in oats shall be ascertained by the moisture tester and the method of use thereof described in Circular No. 72, and supplement thereto, issued by the United States Department of Agriculture, Bureau of Plant Industry, except that the graduated measuring cylinder used shall be that described in Department of Agriculture Bulletin No. 56; or such percentage shall be ascertained by any device and method giving equivalent results.

**Test weight per bushel.**—Test weight per bushel shall be the test weight per Winchester bushel as determined by the testing apparatus and the method of use thereof described in Bulletin No. 472, dated October 30, 1916, issued by the United States Department of Agriculture, or as determined by any device and method giving equivalent results.

**NOTE.**—Under regulations pursuant to the United States grain standards Act, licensed inspectors are required to state under "Remarks" in all certificates issued by them for oats, unless issued for an export shipment, the test weight per bushel in terms of whole and half pounds. For this purpose a fraction of a pound when equal to or greater than a half shall be treated as a half, and when less than a half shall be disregarded.

**Foreign material.**—Foreign material shall be all matter other than grains and pieces of grains of

cultivated oats, except other grains and wild oats, and shall include oats clippings

**Other grains.**—Other grains shall include wheat, corn, rye, barley, emmer, spelt, einkorn, grain sorghums, rice, cultivated buckwheat, and flaxseed only.

**Sound cultivated oats.**—Sound cultivated oats shall be all grains and pieces of grains of cultivated oats which are not heat-damaged, sprouted, frosted, badly ground-damaged, badly-weather damaged, or otherwise distinctly damaged.

**Heat-damaged grains.**—Heat-damaged grains shall be grains and pieces of grains of cultivated oats, other grains, or wild oats, which have been distinctly discolored or damaged by external heat or as a result of heating caused by fermentation.

**Live weevils.**—The regulations pursuant to the United States grain standards Act provide that “(n) in the case of grain graded ‘Sample Grade’ solely on account of the presence of live weevil or other insects injurious to stored grain, the certificate shall state in the space for ‘Remarks’ the grade to which the grain would otherwise be entitled, and there shall also appear on the certificate a statement of the factor or factors which would determine the grade were it not for the presence of such live weevil or other insects injurious to stored grain.”

**Food and Drugs Act.**—Nothing herein shall be construed as authorizing the adulteration of oats by the addition of water, by the admixture of clippings, or hulls, decomposed salvage oats, other grains, or any other foreign material, or otherwise, in violation of the Food and Drugs Act of June 30, 1906.

## THE SAMPLING OF GRAIN.

The obtaining of a representative sample is essential to the determination of the true grade of a given lot of grain. If the sample obtained is not representative no amount of care in making determinations for the grading factors will establish the true grade of the grain sampled. Consequently, great care should be taken in sampling in order that the sample on which the grade of the grain is to be based shall truly represent the grain sampled.

Regulation 5 of the regulations of the Secretary of Agriculture under the United States grain standards Act, given in Circular No. 70, Office of the Secretary, United States Department of Agriculture, states:

“SEC. 7. For the purposes of an appeal or dispute no sample shall be deemed representative unless of the size and procured in accordance with the method prescribed in instructions issued by the Chief of the Bureau of Markets and Crop Estimates in effect at the time of taking the appeal or referring the dispute.”

Copy of the current instructions in effect at the time of taking an appeal or referring a dispute may be obtained upon application to any office of Federal Grain Supervision.

In accordance with this regulation, the following revised instructions were issued by the Chief of the Bureau of Markets and Crop Estimates, under date of May 11, 1922:

I. It shall be approximately 2 quarts in size. If the time to elapse between the drawing of the

sample and the determination of grade would permit of such change in the condition of the sample as to affect the grade, at least  $1\frac{1}{2}$  pints should be inclosed in an air-tight container and the remainder, if any, in a clean cloth sack.

II. In case of bulk grain in a carload lot, or in a wagon, at least five probes (with a double-shell compartment trier 60 inches long, or one giving equivalent results), and as many more as may be necessary in the discretion of the sampler, shall be taken from the grain in different parts of the car or wagon, as the case may be.

III. In case of bulk grain in a canal boat, barge, ship, or other vessel, at least five probes (with a double-shell compartment trier, or one giving equivalent results), and as many more as may be necessary in the discretion of the sampler, shall be taken at points through each hatch or opening in the deck, or may be drawn from the spout or on the belt or other conveyor from the vessel if taken in such a way as to be representative of the entire lot or parcel.

In case of bulk grain being loaded aboard a canal boat, barge, ship, or other vessel, the sample may be taken from the spout or on the belt or other conveyor to the vessel if taken in such a way as to be representative of the entire lot or parcel.

IV. In case of grain in sacks, samples shall be drawn from as many individual sacks selected at random as will enable the sampler to procure an average and representative sample of the entire lot.

V. In case it shall appear that a material portion of a lot or parcel of grain is in any manner distinctly inferior to the remainder of the lot or parcel, a separate sample otherwise complying with these

instructions shall be taken from such portion and from the remaining portion. There shall be filed with such sample a statement showing the estimated quantity of each portion of the grain from which each such sample was taken.

### GRAIN TRIER (PROBE) AND SAMPLING CANVAS.

For obtaining a representative sample from a carload of bulk grain the use of the double tube, separate compartment grain trier (probe) shown in Figure 1 is recommended.

The use of such a trier makes it possible for the sampler to note any unevenness in loading and also to ascertain the approximate location and quantity of any mixture of grain or of dirty, smutty, heating, or damp spots, etc., found in any part of the grain. In order to assist in doing this it is advisable to use a canvas 5 by 2 feet in dimensions on which to empty the grain from the trier. The grain should be emptied lengthwise on the canvas, each separate trierful apart from the others, so that the grain from each compartment can be noted separately.

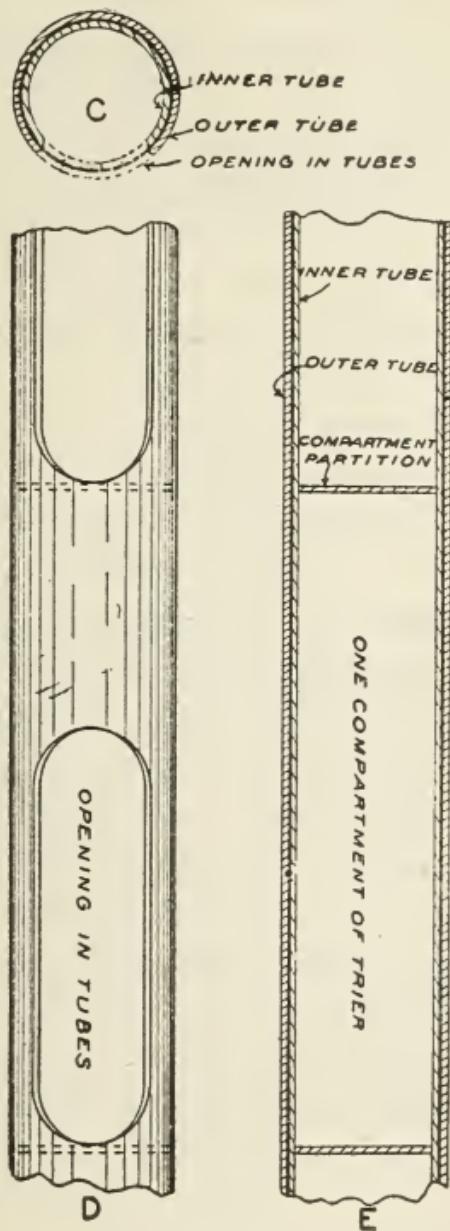


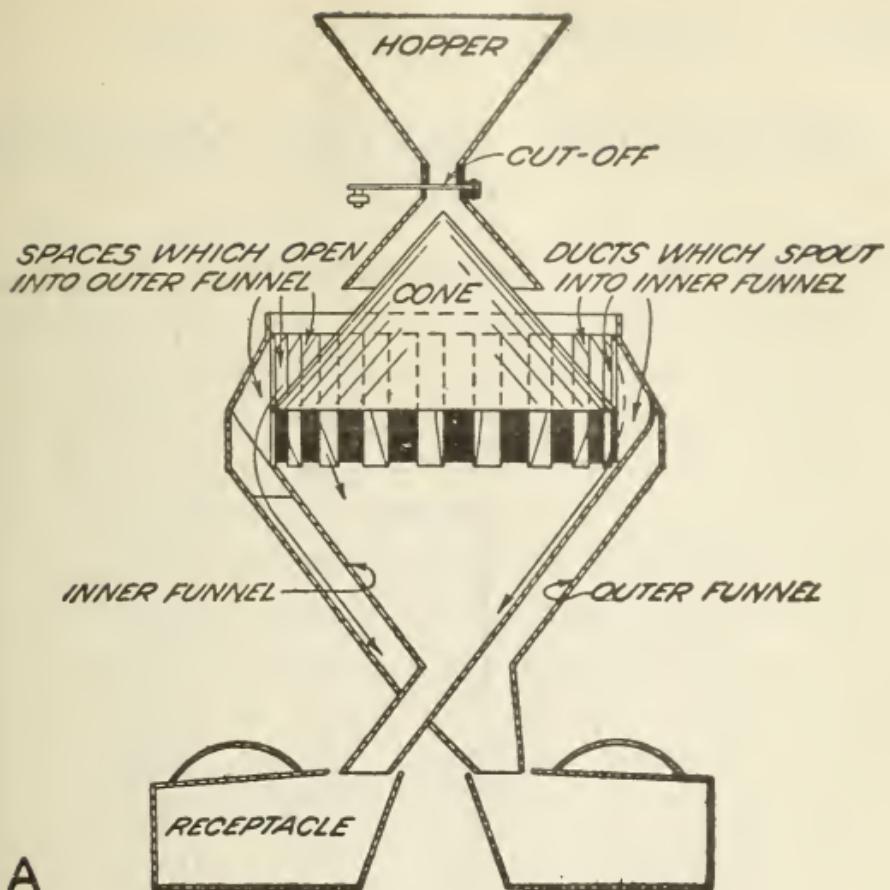
FIG. 1.—Grain trier (probe). Double-tubed, separate-compartment grain trier (probe), recommended by the Department of Agriculture. A, trier closed; B, trier open; C, cross section, showing double tubes; D, sectional view; and E, longitudinal view, showing compartments.

## SAMPLING DEVICE.

After a representative sample of the lot or parcel of grain to be graded is obtained, it is usually necessary to reduce its size considerably, in order that the grade may be determined by careful analysis. To reduce the size of a sample of grain containing foreign substances of different specific gravity or size than of the grain with which they are mixed, and at the same time obtain a sample as representative as the original is hardly possible except by mechanical means.

Figure 2 illustrates a device which will divide a sample into smaller portions and still maintain the proper proportions for the various factors of the original sample. In the operation of this device the grain is placed in a hopper at the top of the machine and released, when it passes through an opening at the bottom of the hopper, down the sides of a cone, the point of which is directly under the center of the opening. Around the base of the cone are 36 pockets, or openings. The grain falling down the sides of the cone is cut into 36 separate streams, which, a little farther on, merge into two streams. Streams Nos. 1, 3, 5, 7, etc., and Nos. 2, 4, 6, 8, etc., unite, forming two separate streams and empty into separate receptacles.

This device and a simplified form of it are fully described in United States Department of Agriculture Bulletins Nos. 287 and 857.



A

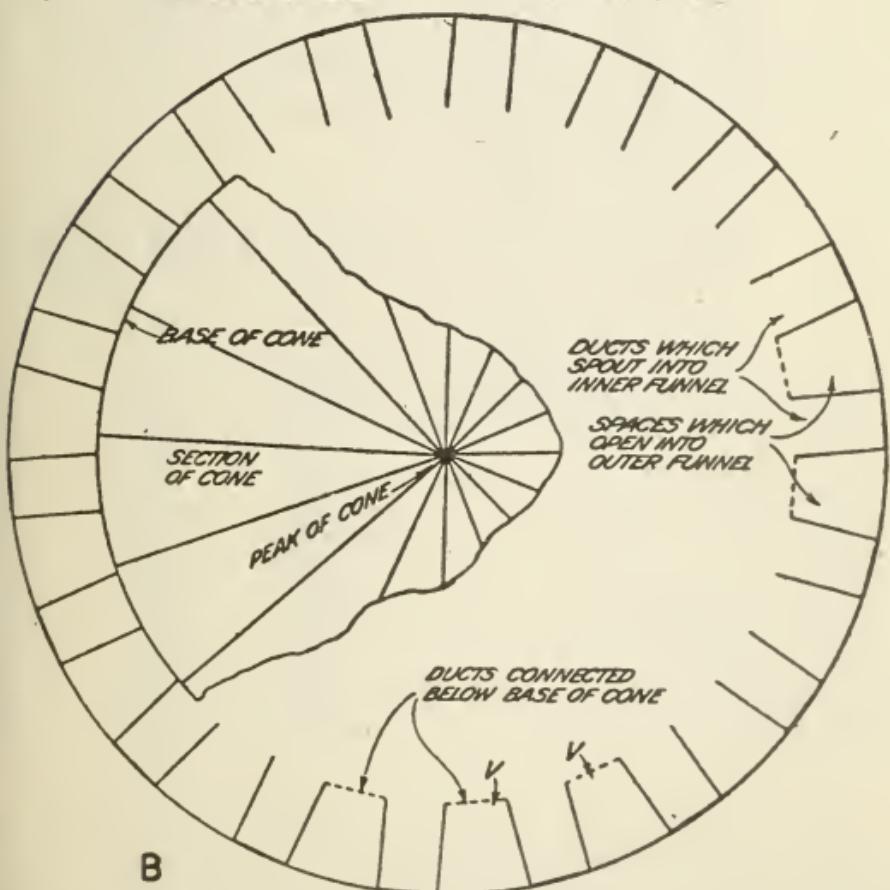


FIG. 2.—Sampling device. A, vertical cross section of device showing paths taken by the material in passing from the hopper to the containers; B, cross section of the device at the base of the cone.

## METHOD OF MAKING MOISTURE TESTS.

Owing to the numerous methods of making moisture determinations and the wide variations in the results obtained by the different methods, the tester and method described in Circular No. 72 of the Bureau of Plant Industry, United States Department of Agriculture, have been designated as the standard on which the grades are based. This in no way precludes the use of other methods of making moisture determinations, so long as the results are corrected to conform to those secured by the standard method specified. Figure 3 represents a sectional view of the official standard moisture tester.

In making moisture tests, use the quantities of oil and grain and extinguish the flame as listed in the following table of specifications:

Kind of grain.	Oil in flask.	Weight of grain in flask.	Extin- guish the flame at—		
			C. c.	Grams.	° C.
Wheat.....		150		100	180
Shelled corn.....		150		100	190
Oats.....		150	1 50		195
Rye.....		150	100		175
Grain sorghums.....		150	100		190
Barley.....		150	100		190
Flaxseed.....		150	100		175
Head rice (milled).....	2 150		100		200
Second head rice.....	2 150		100		200
Screenings rice.....	3 150		100		200
Brewers' rice.....	3 150		100		200
Brown rice.....	2 150		100		190
Rough rice.....	150		100		190

<sup>1</sup> Use special graduate which is one-half of the volume of the regular graduate; however, the regular graduate may be used by doubling the moisture test reading.

<sup>2</sup> Use glass wool pad 2 inches in diameter and one-fourth inch thick in bottom of flask.

<sup>3</sup> Use double-walled flask (B. P. I. Bulletin No. 56).

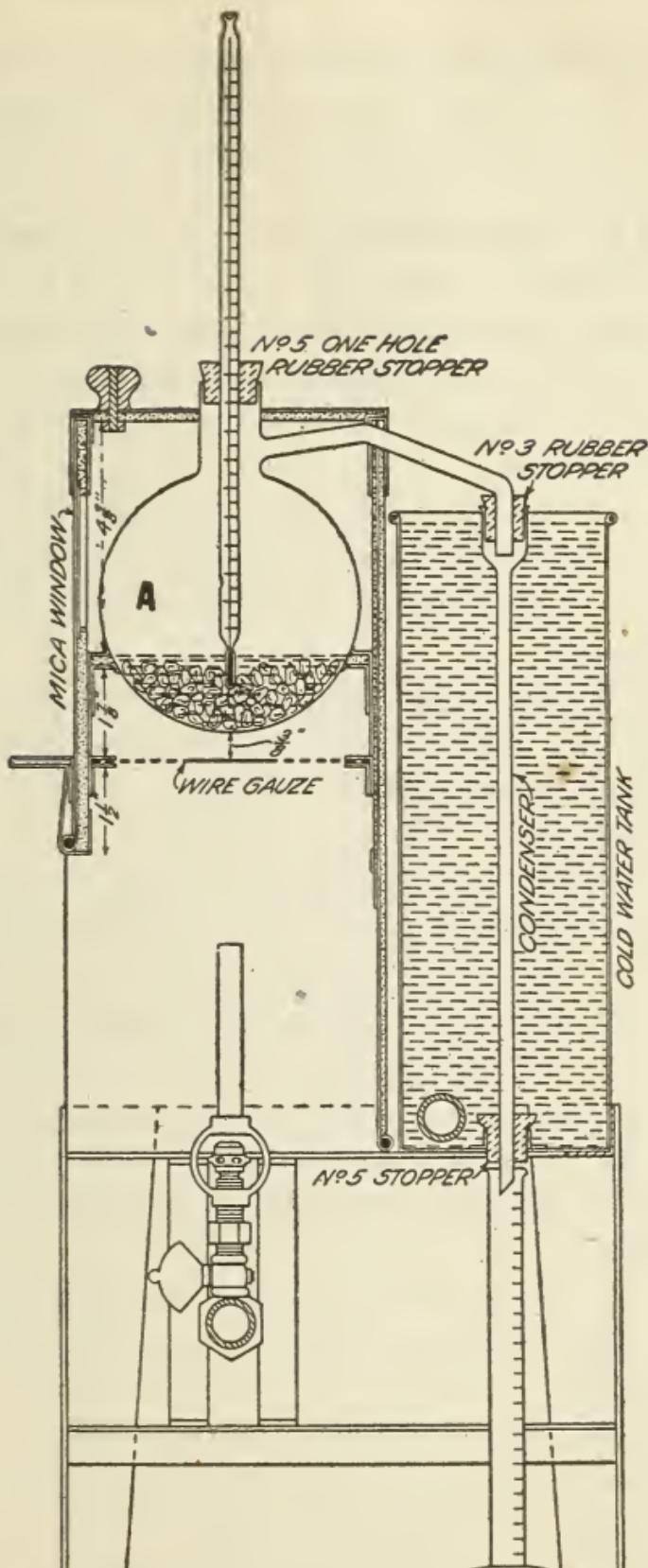


FIG. 3.—Moisture tester. Sectional view of the official moisture tester, showing the various parts properly connected for use; A, distillation flask in position three-eighths of an inch above the wire gauze.

Special points for consideration:

(1) The moisture tester should be installed in a place where it will not be exposed to strong air currents.

(2) The standard tester is equipped for heating with illuminating gas.

(3) The wire gauze with asbestos center should be kept in good condition, and so adjusted that the flame plays directly in the center of the asbestos.

(4) The bottom of the flask should be not less than three-eighths of an inch above the wire gauze.

(5) See that the column of mercury in the thermometer is continuous; if broken, it should be shaken down.

(6) Thoroughly mix the sample before weighing for tests; and unless the test is to be made immediately upon its arrival in the office, place in air-tight container.

(7) Make tests in duplicate, and if duplicates vary over three-tenths of 1 per cent make another test.

(8) Adjust the thermometers so that four-fifths of the mercury bulb is submerged in the grain and oil after the grain has been placed in the flask. (See to the adjustment each time. Do not guess.)

(9) Use correctly graduated thermometers and graduates.

(10) Do not use mushy rubber stoppers as they absorb some of the moisture that should pass into the graduates.

(11) Clean and dry each graduate before using for a test. (Do not let them show any moisture in the bottom or along the sides.)

(12) Do not use oil directly from the previous test. Empty used flasks into a large storage can and never directly into the oil measuring device.

(13) Keep a good circulation of cold water through the condenser tank.

(14) The heating apparatus should be so adjusted that the required temperature is reached in 20 minutes. A longer time will give results too low and a shorter time too high.

(15) If the moisture content of the sample is high so that there is a tendency to boil over, lower the flame until a considerable portion of the water is distilled over.

(16) The heat should be cut off at the exact temperature prescribed for each gram.

(17) After the flame is extinguished a slight gradual rise in the temperature is to be expected. A sudden increase or sudden decrease in temperature of several degrees indicates that the flame was too intense during the latter part of the heating, and the test should be repeated.

(18) Do not remove covers, nor remove thermometers, until the temperature recedes to 160°C.

(19) After the temperature has fallen to 160° C. or lower, disconnect thermometer and then the delivery tube.

(20) Read the percentage of moisture in the graduated cylinder after all the drops clinging to the sides of the graduates have been shaken down. The reading is taken beneath the layer of oil on top of the water.

(21) Results of tests need not be expressed more closely than one-tenth of 1 per cent.

(22) If the water which distills over is discolored, the substance has evidently been burned and the test should be repeated.

(23) When machine is not in use keep thermometers connected in the flasks and the flasks

connected with the distilling tubes in the same manner as for making a test.

(24) Before making a test in a new flask, or before using a machine that has not been in use for a 24-hour period, a test should be made on a preliminary sample so that all the flasks will be uniform in condition.

(25) Place scales on a firm support and see that they are in balance before making a weighing.

(26) The specific directions given above and in Bureau of Plant Industry Circular No. 72 for making tests do not apply to modified forms of testers.

## DOCKAGE IN WHEAT.

### EQUIPMENT FOR SEPARATING DOCKAGE IN WHEAT.

In determining the quantity of dockage in connection with the official grading of wheat, the following cleaning devices are used in the offices of Federal Grain Supervision:

1. A small wheat tester or device for removing barley, oats, wild oats, pieces of straw, weed stems, and other coarse matter from wheat. On account of the peculiar short, jerky motion of the riddle, this machine has been popularly designated as the "wild-oat kicker."

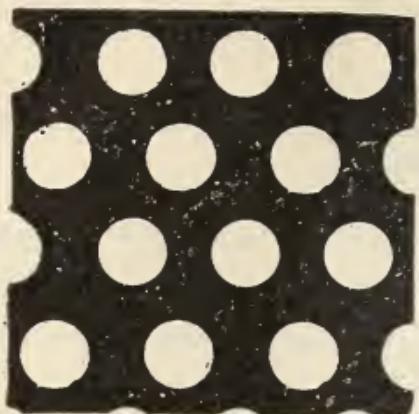
2. Set of perforated metal hand sieves. The sieves and bottom pan should be circular in shape and made of aluminum, brass, or other suitable material. The smooth surface of the metal should face up. The metal should be 0.025 to 0.035 inch in thickness.

(a) Bottom pan: Inside diameter should be  $13\frac{1}{8}$  inches; depth  $2\frac{1}{2}$  inches; and roll at top of pan  $\frac{3}{16}$  inch in diameter.

(b) Buckwheat sieve: With triangular perforations  $\frac{8}{64}$  inch on each side of perforations; inside diameter of sieve should be 13 inches; depth of sieve 2 inches, and roll at top of sieve should be  $\frac{1}{4}$  inch in diameter.

(c) Fine seed sieve: With round perforations  $\frac{1}{12}$  inch in diameter. (Other specifications and dimensions same as for (b) buckwheat sieve above.)

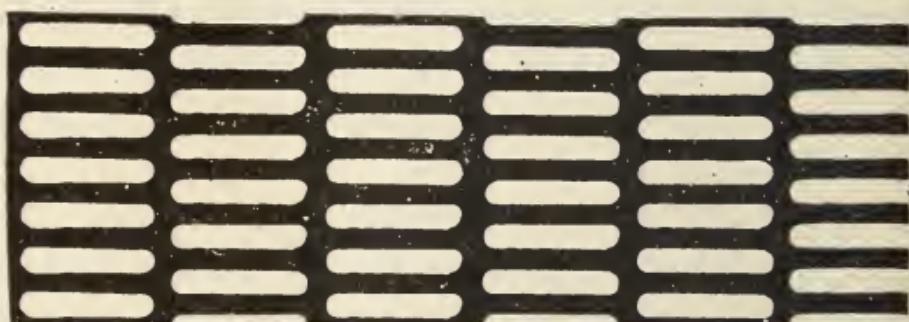
(d) Fine chess sieve: With slotted perforations, 0.064 inch wide by  $\frac{3}{8}$  inch long. (Other specifications and dimensions same as for (b) buckwheat sieve above.)



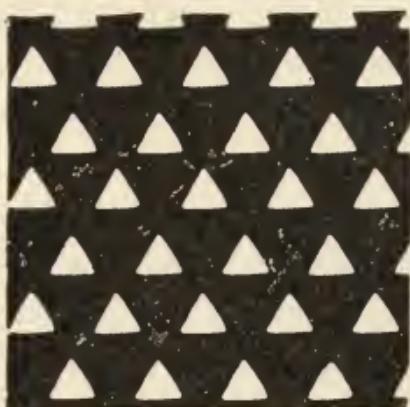
SCALPER SIEVE



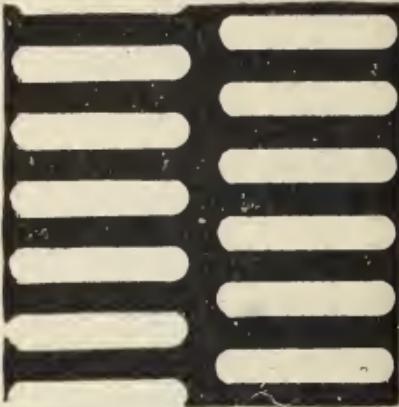
FINE SEED SIEVE



FINE CHESS SIEVE



BUCKWHEAT SIEVE



COARSE CHESS SIEVE

FIG. 4.—Illustrating the perforations (full size) of the dockage sieves adopted by the United States Department of Agriculture, in connection with the enforcement of the United States grain standards Act. Buckwheat sieve, triangular perforations  $\frac{9}{16}$  inch long on each side of perforation; scalper sieve, round perforations  $\frac{13}{16}$  inch in diameter; fine chess sieve, slotted perforations 0.064 inch wide by  $\frac{3}{8}$  inch long; coarse chess sieve, slotted perforations 0.07 inch wide by  $\frac{1}{2}$  inch long; fine seed sieve, round perforations  $\frac{1}{2}$  inch in diameter.

(e) Coarse chess sieve: With slotted perforations 0.070 inch wide by  $\frac{1}{2}$  inch long. (Other specifications and dimensions same as for (b) buckwheat sieve above.)

(f) Scalper sieve: With round perforations  $\frac{1}{64}$  inch in diameter; depth of sieve should be  $1\frac{1}{2}$  inches, inside diameter should be  $12\frac{7}{8}$  inches, and roll at top of sieve  $\frac{5}{16}$  inch in diameter.

NOTE.—Sieves (b), (c), (d), and (e) should be made to nest very freely with the bottom pan. The scalper sieve (f) should nest very freely with each of the other three sieves and also with the bottom pan.

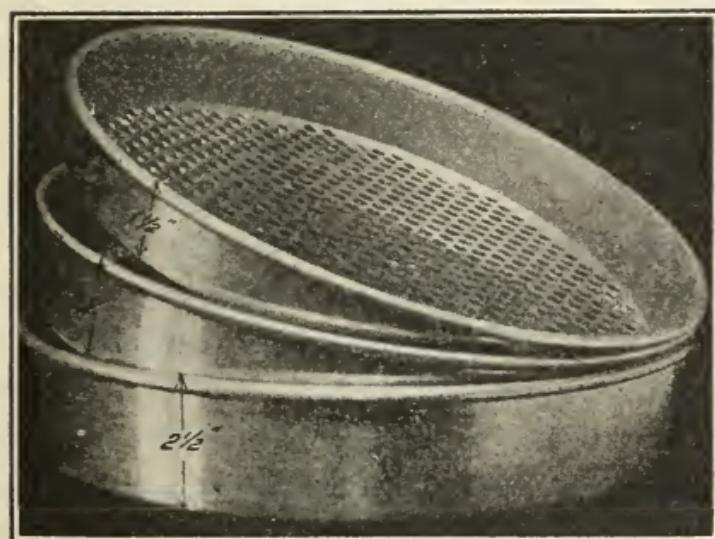


FIG. 5.—Nest of two dockage sieves and bottom pan.

It is absolutely essential that the dimensions of the perforations of the sieves used be exactly as stated above. A slight variation in the dimensions materially influences the percentage of dockage obtained. In order to secure the exact size it is necessary that the perforations be cut with dies especially made for the purpose. Sieves made from tin or galvanized iron with an ordinary punch will not give accurate results. The shape and arrangement of the perforations are illustrated in Figure 4, and the shape and manner of nesting of the sieves are shown in Figure 5.

From experiments in hand screening and cleaning various kinds of foreign matter from wheat, it has been found that with proper care the metal sieves with perforations as indicated for hand sieves, used in connection with the wild-oat separator, will give a practical determination of dockage.

### **METHOD OF DETERMINING DOCKAGE IN WHEAT.**

The following method for determining dockage in wheat prescribed for use in offices of Federal Grain Supervision is recommended for use by licensed grain inspectors and others:

Dockage must be determined on approximately 1,000 grams.

Such sieve or sieves should be used as will remove the foreign material with the least possible loss of wheat, including small, plump, or badly shriveled kernels or large pieces of broken kernels.

Ordinarily the fine seed sieve with the round perforations one-twelfth inch in diameter, together with the scalper sieve or the "wild-oat kicker" will be sufficient.

Wheat containing coarse dockage must first be cleaned over the "wild-oat kicker" or a machine giving equivalent results.

If it contains an appreciable quantity of oats, barley, or foreign material of like shape it must be run over the machine twice, but in no case more than twice.

The fine seed sieve must be used as the bottom sieve of the "wild-oat kicker" in all cases.

The durum wheat riddle must be used for all durum and winter wheats or admixtures where durum or winter wheat predominates.

The spring wheat riddle must be used for all spring wheat or admixtures where spring wheat predominates.

If the wheat contains an appreciable amount of wild buckwheat or similar seeds after running through the "wild-oat kicker" work it over the buckwheat sieve in a vigorous manner, using approximately one-third of the sample at a time.

All material passing through the "fine seed" sieve and/or the buckwheat sieve shall be rescreened in the following manner: The material should be carefully deposited on the edge of the sieve, then while holding the sieve at an angle of 25 or 30°, with the wheat at the upper edge, the sieve should be lightly oscillated in a side motion until all the material has passed either to the opposite edge of the sieve or through the perforations. If operated properly, the material at the opposite edge of the sieve will consist mainly of wheat, and should be classed as wheat and not as dockage.

Material passing through the buckwheat sieve shall be rescreened over the buckwheat sieve and all reclaimed wheat put back in the sample.

Material passing through the fine seed sieve shall be rescreened over the fine seed sieve and all reclaimed wheat put back in the sample.

In exceptional cases it may be necessary to repeat the rescreening in order to arrive at an equitable determination of the percentage of dockage.

Whenever it is necessary to screen for chess first run the sample over the "wild-oat kicker" as described above, then if there still remains in the sample an appreciable quantity of chess, work it over the fine chess sieve, with perforations 0.064

by 0.375 inch, except when the sample consists of wheat of large kernels mixed with large chess seeds.

Material passing through the chess sieve should be rescreened over the fine seed sieve by depositing the material on the lower edge of the sieve held at an angle of 25 or 30°, striking the lower edge of the sieve with one hand in such manner that will cause the material to bounce up and down; this will cause the chess to drop end and pass through the perforations in the sieve; continue this operation until the major portion of the material remaining on the sieve is small shriveled kernels or broken pieces of wheat; all material passing through the sieve in this operation shall be considered dockage.

Large chess and darnel seeds in a sample of wheat consisting mainly of small kernels of wheat from which the chess can not be separated readily should be considered as "foreign material other than dockage" and the sample handled and graded accordingly.

When the "wild-oat kicker" is not available the scalper sieve is to be used for removing coarse foreign material. Any threshed wheat kernels removed with the coarse foreign material should be picked out and returned to the wheat, and should not be considered as dockage.

The dockage will therefore be represented by the coarse foreign material in addition to the finer screenings obtained by hand sieving.

Since any foreign material remaining in the wheat after removal of dockage is considered as "foreign material other than dockage," in which capacity it may directly affect the grade, great care should be used in sieving the samples.

## **FOREIGN MATERIAL AND CRACKED CORN.**

“Foreign material and cracked corn,” as provided for in section 6 of the official corn standards, includes the material that will pass through a sieve with round holes  $\frac{1\frac{3}{4}}{6}$  inch in diameter, and in addition any coarse foreign matter which remains on the sieve. The corn sieve is of the same size and design as the scalper sieve illustrated in Figure 4.

## **FOREIGN MATERIAL IN OATS.**

In determining the quantity of foreign material in connection with the official grading of oats, in the offices of Federal Grain Supervision, not less than 250 grams of the original sample is cleaned over the buckwheat sieve (Fig. 4, p. 40) to remove the seeds and dirt. Small pin oats which pass through the sieve are recovered by rescreening, and any foreign material remaining in the sample is picked out by hand.

## **TEST WEIGHT PER BUSHEL.**

### **TEST WEIGHT TO BE DETERMINED ON DOCKAGE-FREE WHEAT.**

The official standards for wheat provide that the determination of the test weight per bushel shall be made upon the basis of the grain from which the dockage has been removed. The test weight per bushel is one of the main factors in determining the grade of grain, and a sufficient quantity of the original sample should be free from dockage to permit the test weight to be made with a quart tester. Under average conditions a sample of 1,000 grams of wheat containing the dockage give a sufficient amount of dockage-free wheat for determining the test weight with a quart tester. However, if the wheat contains a large amount of coarse material and other foreign matter it will sometimes be necessary to remove the dockage from more than 1,000 grams in order to secure a sufficient quantity of dockage-free wheat to make the test weight with a quart tester.

### **STANDARD METHOD OF MAKING THE TEST.**

The conditions given in the method described below have been found to be essential in making uniform tests of weight per bushel and obtaining accurate results, and have been adopted as standard in connection with the enforcement of the United States grain standards Act.

1. Use an accurate quart-sized tester.
2. Fill the kettle from a hopper.
3. Opening at bottom of hopper must be round and exactly  $1\frac{1}{4}$  inches in diameter.

4. Bottom of opening must be held exactly 2 inches above center of kettle.
5. Mark hopper on inside at a point where it will hold just sufficient grain to cause overflow over all sides of kettle.
6. Use same volume of grain for each test.
7. Use a stroker made of hardwood with smooth rounded edges, 12 inches long,  $\frac{3}{8}$  inch thick, and  $1\frac{3}{8}$  inches broad.
8. Place the stroker on the edge of the kettle lightly without jarring the kettle.
9. Stroke the grain from the kettle with three full-length zigzag motions of the stroker.
10. Hold the stroker on the kettle with its sides held in a vertical position.
11. Make the stroke clean all the way across the kettle.
12. Have the kettle rest on a firm base.
13. Do not jar the kettle before or during the stroking operation.
14. If the top of the kettle is rough, smooth down the roughness with a rounded metal bar, but do not use a file for the purpose.
15. Make the test immediately after the sample has been brought to the inspection room, office, or laboratory, to prevent drying out of the grain with consequent change in its test weight.
16. In the case of wheat and other grains for which the standards provide a specification for "dockage," make the test on the grain after the dockage has been removed.
17. The quart kettle must have a capacity of exactly 67.2 cubic inches.
18. Use a beam which is both accurately graduated and sensitive to one-tenth pound per bushel.

19. Have your grain tester tested periodically for—  
 (a) Accuracy of kettle capacity,  
 (b) Accuracy of beam readings, and  
 (c) Sensitiveness of beam.

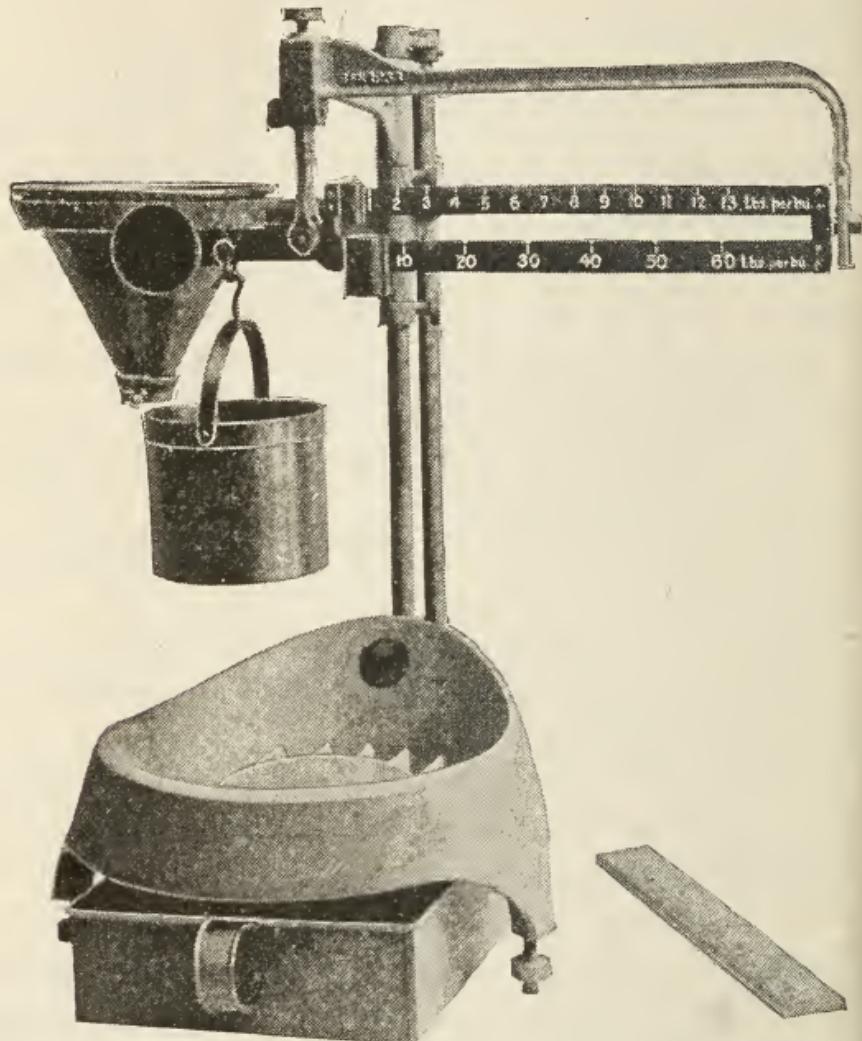


FIG. 6.—Standard apparatus for determining the test weight per bushel of grain.

The method of testing the accuracy of the test kettle and the accuracy and sensitiveness of the weighing beam of any weight per bushel testing outfit is given in Department of Agriculture Bulletin No. 1065.

Any office of Federal Grain Supervision will be glad to test your apparatus for accuracy, or arrange to have it tested for you free of charge.

# METHOD FOR DETECTING SULPHUR-BLEACHED GRAIN.

The conditions given in the method described below for the detection of sulphured grain have been found to be essential in obtaining accurate results.

## CHEMICALS AND APPARATUS.

1. Solution of lead acetate (tribasic salt), prepared by dissolving 1 gram of lead acetate in 100 c. c. of distilled water.
2. Dilute solution of hydrochloric acid, made by adding one part of hydrochloric acid to four parts of distilled water.
3. Mossy zinc free from sulphur.
4. Erlenmeyer flask, capacity 500 c. c. (or the flask devised by the United States Department of Agriculture and described in Service and Regulatory Announcement (Markets) No. 55).
5. Inverted L-shaped delivery tube, the short arm to be 2 inches long, the long arm 6 inches long, and the cross tube 4 inches wide.
6. Cork stoppers of good quality.
7. Test tubes: Several of 25 c. c. capacity.

## METHOD OF MAKING THE TEST.

Place 100 grams of the grain to be examined, together with 10 grams of mossy zinc, in a 500 c. c. Erlenmeyer flask. Pour into the flask enough of the diluted hydrochloric acid to just cover the grain. Close the flask with the cork containing the L-shaped delivery tube, and place the

long arm of the delivery tube in a test tube containing 15 c. c. of the 1 per cent lead acetate solution. The test tube should not be over three-fourths full of lead acetate solution in order to prevent spilling when the gas begins to pass over.

The delivery tube should extend to within one inch of the bottom of the test tube. If the grain has been sulphur bleached, the gas coming over will combine with the lead acetate solution and produce lead sulphid, a brownish-black precipitate. If the grain has not been sulphur bleached, the liquid in the test tube will remain clear. Should the grain be very dirty, fine granules will occasionally be seen held in suspension in the acetate solution in the test tube, and the same condition will obtain if the acid is too strong. This fine precipitate should not be mistaken for lead sulphid. To test these granules, add to the test tube a few drops of ferric chloride (one part ferric chloride to 10 parts distilled water). If they are lead sulphid they will dissolve immediately.

### **SPECIAL POINTS FOR CONSIDERATION.**

1. It is essential that either mossy or granular zinc be used; other forms are not satisfactory.
2. A preliminary blank test, using everything except the grain, should be run with every test, and the results compared with the test on the grain.
3. At times, because of the purity of the zinc, the action between the acid and the zinc is slow. The action may be made more vigorous by adding to the flask a few drops of a 10 per cent ferric chloride or copper sulphate solution.

## APPARATUS FOR GRADING WHEAT, SHELLED CORN, AND OATS AC- CORDING TO THE OFFICIAL GRAIN STANDARDS.

For the information of persons who desire to equip laboratories for the grading of wheat, shelled corn, and oats according to the official grain standards of the United States the following equipment is regarded as essential:

1. Brown-Duvel moisture tester, completely equipped with flasks, certified centigrade thermometers to read correctly from 170° to 195°; graduates of 25 c. c. capacity; one-hole rubber stoppers, sizes No. 5 and No. 3; condenser tubes; 150 c. c. oil measuring device; supply of oil, etc. (See United States Department of Agriculture, Bureau of Plant Industry Circular No. 72.)
2. A convenient apparatus for detecting sulphured or bleached oats consists of an Erlenmeyer flask of 500 c. c. capacity, filled with a hollow ground-glass stopper with a glass delivery tube, and a 6-inch test tube about 1 inch in diameter. (See S. R. A. 55 (Markets), United States Department of Agriculture.)
3. Balance, capacity 1,000 grams, sensitive to one-tenth gram, with set of weights, 1 gram to 1,000 grams.
4. Balance, capacity 500 grams, sensitive to one-tenth gram, with set of weights, 1 gram to 500 grams.
5. Balance, capacity approximately 50 grams, graduated beam to read 1 gram and fractions of a

gram, sensitive to one-tenth gram, with set of weights, 1 gram to 50 grams.

6. Set of perforated metal hand sieves for use in the determination of dockage in wheat. (For specifications of the "dockage" sieves see "Equipment for separating dockage in wheat," p. 39.)

7. A small wheat tester or device for removing barley, oats, wild oats, pieces of straw, weed stems, and other coarse matter from wheat, popularly designated as the "wild-oat kicker." (For further reference see "Equipment for separating dockage in wheat," p. 39.)

8. Sieve and pan for use in the determination of "foreign material and cracked corn" in corn:

(a) Bottom pan: Inside diameter should be  $13\frac{1}{8}$  inches, depth  $2\frac{1}{2}$  inches, and roll at top of pan  $\frac{3}{16}$  inch in diameter.

(b) Corn sieve: With round perforations  $\frac{1}{6}\frac{2}{3}$  inch in diameter. This sieve should be made to nest very freely with the bottom pan.

9. Weight per bushel tester (grain tester), 1 quart capacity, with funnel having an outlet opening  $1\frac{1}{4}$  inches in diameter, opening held in place 2 inches above the test kettle and a hard-wood stick  $\frac{3}{8}$  inch thick by  $1\frac{3}{4}$  inches broad and 12 inches long, with long edges rounded to a semicircle, for stroking the grain from the overflow test kettle. (This apparatus is fully described in United States Department of Agriculture Bulletin No. 472.)

10. A device for correctly dividing a grain sample into smaller portions for analysis and moisture determinations. (See United States Department of Agriculture Bulletin No. 287.)

11. Grain trier (grain probe), 60 inches long. The trier should be double-shelled and divided into compartments.

12. Sampling canvas, 5 by 2 feet in dimensions, on which to empty the grain from the trier.

13. Air-tight containers (sample cans), capacity approximately 450 grams.

14. Cloth sample bags, waterproofed, capacity at least 2 quarts.

15. Grain pans, with spout for pouring into other containers.

In addition to the apparatus listed above, the following equipment will be found convenient and desirable:

1. Extra moisture-testing equipment: Flasks, thermometers, graduates, rubber stoppers, test-tube cleaners, etc.

2. Five-gallon oil can equipped with faucet.

3. Five-gallon oil can equipped with strainer funnel to recover oil.

4. Five-gallon refuse can.

5. Small funnel to fit in moisture flasks for pouring sample into the flasks.

6. Tweezers for mechanical analysis.

7. Small grain scoop.

8. Brush for cleaning up grain and grain dust.

9. Heavy table for handling samples, analysis, etc.

30. Furniture, including chairs, stationery supplies, files, etc., to keep proper records.

## APPEALS AND DISPUTES UNDER THE UNITED STATES GRAIN STANDARDS ACT.

The United States grain standards Act provides in part, as follows:

### APPEALS.

“That whenever standards shall have been fixed and established under this act for any grain and any quantity of such grain sold, offered for sale, or consigned for sale, or which has been shipped, or delivered for shipment in interstate or foreign commerce shall have been inspected and a dispute arises as to whether the grade as determined by such inspection of any such grain in fact conforms to the standard of the specified grade, any interested party may, either with or without reinspection, appeal the question to the Secretary of Agriculture, and the Secretary of Agriculture is authorized to cause such investigation to be made and such tests to be applied as he may deem necessary and to determine the true grade: *Provided*, That any appeal from such inspection and grading to the Secretary of Agriculture shall be taken before the grain leaves the place where the inspection appealed from was made and before the identity of the grain has been lost, under such rules and regulations as the Secretary of Agriculture shall prescribe.”

## DISPUTES.

“That any \* \* \* grain sold, offered for sale, or consigned for sale by any of the grades fixed therefor in the official grain standards may, upon compliance with the rules and regulations prescribed by the Secretary of Agriculture, be shipped in interstate or foreign commerce without inspection from a place at which there is no inspector licensed under this act to a place at which there is no such inspector, subject to the right of either party to the transaction to refer any dispute as to the grade of the grain to the Secretary of Agriculture, who may determine the true grade thereof.”

## FEES AND CHARGES.

“Whenever an appeal shall be taken or a dispute referred to the Secretary of Agriculture under this act, he shall charge and assess and cause to be collected a reasonable fee, in amount to be fixed by him, which fee, in case of an appeal, shall be refunded if the appeal is sustained. All such fees, not so refunded, shall be deposited and covered into the Treasury as miscellaneous receipts.”

## SECRETARY’S FINDINGS.

“The findings of the Secretary of Agriculture as to grade, signed by him or by such officer or officers, agent or agents of the Department of Agriculture as he may designate, made after the parties in interest have had opportunity to be heard, shall be accepted in the courts of the United States as *prima facie* evidence of the true grade of the grain determined by him at the time and place specified in the findings.”

The regulations of the Secretary of Agriculture under the United States grain standards Act provide in part as follows:

## HOW TO FILE AN APPEAL OR DISPUTE.

Appeals are taken and disputes are referred to the Secretary of Agriculture by filing either a complaint or stipulation in the proper office of Federal Grain Supervision. A complaint or stipulation may be filed in writing or by telegraph. The proper form for the complaint or stipulation and all other regulations of the Secretary of Agriculture under the United States grain standards Act are given in the United States Department of Agriculture, Office of the Secretary Circular No. 70.

## AGREED SAMPLES IN APPEALS AND DISPUTES.

Samples of the grain involved in an "appeal" or a "dispute" referred to an office of Federal Grain Supervision for determination of the true grade of the grain may be agreed upon in accordance with the regulations of the Secretary of Agriculture, or drawn by a person authorized to do so by the Department of Agriculture.

### AGREED SAMPLES.

In the case of agreed samples the Regulations of the Secretary of Agriculture provide in Regulation 5, in part, as follows:

SEC. 3. *Agreed sample in appeal.*—In case of an appeal, a representative sample of the grain involved may be agreed upon by the party or parties and the licensed inspector from whose determination the appeal is taken. In such case there shall be filed with such sample a written agreement, signed by each party or his agent and by the licensed inspector, in substantially the following form:

We agree that the accompanying sample is a representative sample drawn by .....  
(Name of sampler.)

on ..... 192.., from a certain lot or parcel of grain identified and then located as follows: .....

..... and involved in an appeal filed, or to be filed, in the Office of Federal Grain Supervision at .....

Place .....

Date .....

..... Appellant.

..... Respondent, if any.

..... Licensed Inspector.

SEC. 4. *Agreed sample in dispute.*—In case of a dispute a representative sample of the grain involved may be agreed upon by the parties. In such case there shall be filed with such sample a written agreement, signed by each party or his agent, followed by the certification of a disinterested third person, in substantially the following form:

We agree that the accompanying sample is a representative sample drawn by .....

(Name of sampler.)

on ..... 192.. from a certain lot or parcel of grain identified and then located as follows: .....

..... and involved in a dispute filed, or to be filed, in the office of Federal Grain Supervision at .....

Place .....

Date .....

..... (Complainant.)

..... (Respondent.)

I hereby certify that I am not interested in the dispute above mentioned or in the grain involved therein, and that the sample mentioned is a representative sample drawn from the grain involved.

-----  
(Name.)

-----  
(Occupation.)

-----  
(Address.)

#### **DELIVERY OF SAMPLES.**

"SEC. 6. *Delivery of samples.*—Samples of grain involved in an appeal or dispute shall be delivered in person, or transmitted by express or parcel post, to the office of Federal Grain Supervision in which the appeal or dispute is filed."

For further information regarding the United States grain standards Act, the regulations of the Secretary of Agriculture thereunder, or the official grain standards for wheat, shelled corn, or oats, apply to any office of Federal Grain Supervision, or to the Chief, Bureau of Agricultural Economics, Department of Agriculture, Washington, D. C.

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